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(54) Abstract Title
Apparatus for controlling light

(57) Lighting control apparatus for disco type effects comprises a plurality of mirrors 44 positioned so as to each receive a beam of light and being independently movable such that the direction of a reflected beam of light is adjustable. Each mirror 44 is mounted on a support 48 rotatable about a central axis. Each mirror is optionally mounted to revolve around its own axis in which case the optical effect is of double rotation, beams about a central axis and each individual about its own axis.

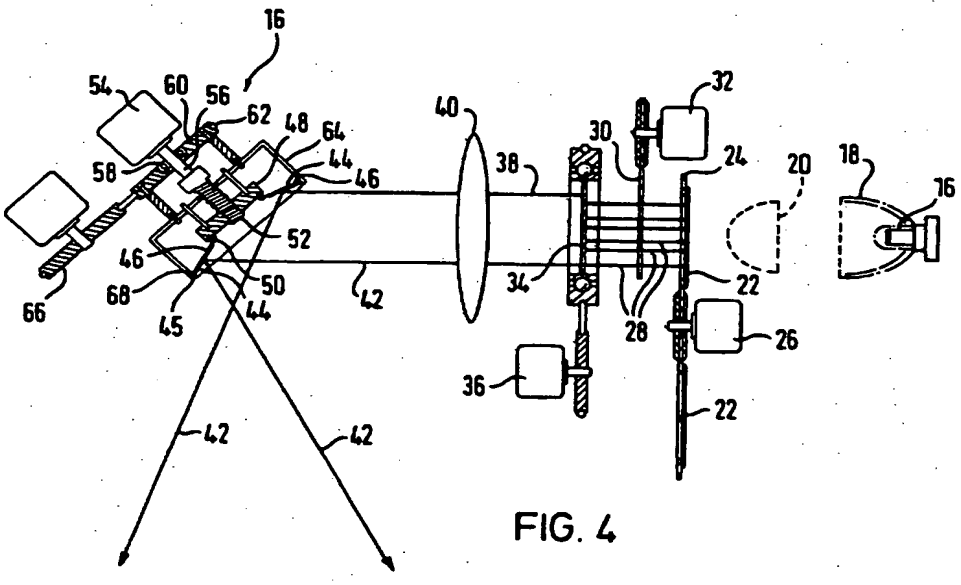

FIG. 4

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APPARATUS FOR CONTROLLING LIGHT

This invention relates to apparatus for controlling lights. More particularly but not exclusively this invention relates to a lighting control system for special effect lighting.

Special effect lighting is commonly used in discotheques and theatres. In discotheques it is desirable to combine the movement and colour of light with music. A simple method of producing special effects with light is to shine a light onto a ball coated with a large number of small mirrors. This produces a large number of beams. It is also known to produce three dimensional lighting effects by directing a beam of light through smoke. This is only possible with a narrow concentrated beam of light (pin spots) since ordinary spot lights produced a less concentrated beam.

Developments in this technical field, over the last 20 years have been mainly concerned with the movement of light with music. Early proposals included flashing lights to different frequencies of music. This gave a dramatic effect since different lights reacted to the various bass beats of the music. The eye could easily follow these changes in light and this effect was commonly known as the Sound Chaser or Sound Sequencer.
One major development was the introduction of 'the helicopter'. This comprised a number of pin spot lights arranged around a centre piece, as indicated in Figure 1. The separate lamps of the helicopter are manually adjustable to be angled and rotated using a motor until the desired effect is achieved. The provision of individually adjustable heads allows the helicopter to be used with different ceiling heights. The movement of lighting arrangements such as the helicopter is usually controlled by a lighting engineer or disc jockey.

More recently the pin spot has been replaced by the 'flower effect' light The principle of the flower effect was to invert the principle of the mirrored ball. A plurality of coloured mirrored pieces are arranged on the concave surface of a dish. When light is directed onto this surface the beams of light from the mirrors converge to a common point which is then passed through a lens. After converging the beams would the continue into a flower pattern. This is indicated in figure 2. As with all modern lighting effects the 'flower effect' light is controllable in terms of sound activation and rotation.

More recent developments have included 'intelligent lighting'. This principle involves directing a beam of light through a colour filter and a shape commonly known as a GOBO. This beam is then directed onto a mirror which is fixed to two or more motors. Thus the direction, shape and colour of a beam of light could be controlled remotely.

One of the problems associated with the recent developments in special effect lighting is the need for a digital language capable of controlling a large number of lights at any given time. This has been addressed by the digital language, DMX. Advantageously DMX dispenses with the need for a large number of wires connecting the various lighting effects. Only one cable is needed from the DMX controller and all the subsequent effects are linked together. This control system is 'intelligent' since it is capable of assigning the corrected information to the correct lighting effect.

One of the most recent advances includes the ability to project a large number of beams from one source in the colour and shape of a DJ's

choice and move them in time to music. This advance uses a combination of the 'flower effect ' dish and the separately selectable colours and shapes described above. It is achieved by fitting a plurality of silver mirrored pieces to the concave surface of a dish and the passing the reflected beams of light through a selection of colours and 'GOBOS' mounted on a motorised wheel. The motors are controlled by the above mentioned DMX control system.

Various problems are associated with the above advances in special effect lighting. The 'helicopter' effect employs a brush gear which tend to wear quickly. Also it is extremely difficult to change the colours of each individual lamp of the helicopter whilst in operation. Such changes in colour would have to be provided during non-operation of the helicopter. The standard helicopter was capable of little control (i.e. of lighting colour and shapes) once in operation, other than turning it off and on. However, the helicopter is the only system which produces a 'carousel' lighting effect which is capable of beam angle adjustment albeit manual adjustment. This effect is the rotation of all the lights around a centrepoint. It was also not possible to use the helicopter in combination with gobos and colours for each light since the wiring involved was prohibitive to free movement of the individual pin spot lamps of the helicopter. Also even the limited tilting movement of the lamps required adjustment before operation or installation. As such the helicopter has recently become less popular.

Thus it is desirable to have the helicopter 'carousel lighting' effect combined with control over shape and colour of the individual beams, whilst in operation. More recent centrepiece lighting effects have used a multiplicity of pivoting mirrors fixed around a common light source, this

light source being capable of colour change. A number of these more recent centrepiece lighting effects employ spinning dishes to the outside of their case, to attempt to add some rotary movement. However none have reproduced the 360° rotary carousel effect of the helicopter with variable pitch.

According to the invention there is provided lighting control apparatus comprising a plurality of mirrors positioned so as to receive at least one beam of light said mirrors being independently moveable such that the angle of a beam of light reflected therefrom is adjustable wherein each of said mirrors is mounted on a support structure said support structure being rotatable about a substantially central axis such that the beams of light reflected from each mirror are adapted to simultaneously rotate about said substantially central axis.

Advantageously a beam of light from a light source is rotated and formed into a desired shape, then split into a number of beams by the mirrors thus producing a carousel effect of lights spinning in unison.

Also according to the invention there is provided lighting control apparatus comprising a plurality of mirrors positioned to receive at least one beam of light, said mirrors being mounted on a support structure, said support structure being rotatable, means for providing rotation to said at least one beam of light wherein said beam of light being dividable into a plurality of beams of light upon reflection by said mirrors each of said reflected beams being adapted to simultaneously rotate about a common axis.

Advantageously the mirrors are individually adjustable in terms of angle and also capable of rotating around a common axis thus producing a carousel effect of lights which are adjustable in terms of beam pitch.

The invention will now be described by way of example with reference to the accompanying drawings, in which

Figure 1 is an illustration of a prior art 'helicopter' lighting effect

Figure 2 is a diagrammatic illustration of beams of light reflected from the concave surface of a prior art mirrored dish

Figure 3 is a diagrammatic illustration of lighting apparatus according to an embodiment of the present invention.

Figure 4 is a sectional view of the lighting apparatus according to an embodiment of the present invention

Figure 5 is a perspective view on X-X of figure 4.

Referring to figures 3 5 lighting control apparatus shown generally at 10 produces a plurality of beams 12. Each beam produces a spotlight 14 each may comprises any shape, design or colour.

A light source 16 such as a metal halide lamp is positioned within a reflector 18 which directs light onto a condenser lens 20. The condensor lens straightens the rays of light forming the beam produced from the light source. However the condensor may not be required if the beam of light

produced from the light source is of a high quality in terms of focus. This light is then directed through a colour filter 22 mounted on a colour wheel 24. The colour wheel comprises a number of different colour filters and is rotated so as to provide a predetermined colour through which the light is directed. Rotation of colour wheel 24 is operated remotely through motor 26.

A beam of light 28, having passed through the filter 22 of the colour wheel 24 is then directed through a shutter 30 which may be operated at various speeds to provide a flashing light effect. The shutter is again operated remotely through motor 32. The beam of light 28 is then directed through a 'gobo' plate or any suitable means for providing the beam of light with a desired shape such as a photographic slide. A 'gobo' is a well known term in the art to describe shapes cut out of a plate through which light is then directed, the emerging beam of light then being formed in the shape of the gobo. The gobo plate is also remotely operable through motor 36 so as to rotate the beam of light 28. The emerging beam of light 38 is then directed through a focus lens 40.

The beam of light 42 is then directed onto mirrors 44. The mirrors 44 are each mounted on an adjustable plate 46 which is itself mounted on a central support member 48. The mirrors are arranged to be generally adjacent one another such that a substantially concave or convex formation of mirrors is provided as clearly shown in figure 5. The beam of light is then split by the mirrors into a number of beams of light, corresponding to the number of mirrors reflecting light. Each mirror reflects an individual beam of light corresponding to the shape and colour previously selected by the gobo and colour filter.

The plates 46 are flexibly mounted on the central support member 48 through springs 50. This flexible mounting arrangement allows the mirrors to be individually adjusted to alter the angle of the beam reflected. This flexible mounting allows the mirrors to be tilted about one of their ends thus producing a concave (as shown) or convex array of mirrors. Thus if the lighting apparatus was to be ceiling mounted different heights of ceiling could be accommodated without impairing the lighting effect produced. The support member 48 includes a threaded bore mounted on a screw 52.

Rotation of the screw 52 is actuated by a motor 54 thus the angle of the mirrors may be remotely adjusted. Rotation of the screw 52 is enabled by it's attachment to a spindle 56 mounted within a bearing 58 and attached to motor 54.

The mirrors 44 and associated mounting apparatus are housed within a dish 64. One end 45 of the mirrors 44 is mounted within a sliding joint 68 formed in the carousel dish 64. This sliding joint ensures that the mirrors 44 are located in a desired position and the adjustment of their mounting angle via rotation of the screw 52 is smoothly effected. Pulley 60 and associated drive belt 62 are provided to allow rotary movement of the dish 64 and hence the beams reflected form the mirrors 44.

A further motor 66 provides rotating movement to the carousel dish 64 as shown more clearly in figure 5.

Advantageously this lighting arrangement provides the circular carousel movement of the prior art 'helicopter' without the need for individually adjustable lamps. The rotatable gobo wheel 34 and the rotatable colour

wheel 24 also provide the beam of light 38 with a choice of colour and shape. The beams 42 reflected by the mirrors 44 therefore also have colours and shape corresponding to the colour and shape of beam 38 They are also rotatable around both their own axis as shown in figure 3 by arrow A and also about a common axis as indicated by arrow B.

The angle at which the beams 42 are reflected from mirrors 44 is also adjustable to allow for different ceiling heights thus providing variable beam pitch and an added lighting effect of varying the pitch of the beams whilst in operation. This variation in pitch angle is shown in figure 3 by arrows C.

CLAIMS

1. Lighting control apparatus comprising a plurality of mirrors positioned so as to receive at least one beam of light said mirrors being independently moveable such that the angle of a beam of light reflected therefrom is adjustable wherein each of said mirrors is mounted on a support structure said support structure being rotatable about a substantially central axis such that the beams of light reflected from each mirror are adapted to simultaneously rotate about said substantially central axis.

2. Lighting control apparatus according to claim 1 wherein the position of each mirror is independently adjustable.

3. Lighting control apparatus according to claim 2 wherein each mirror flexibly mounted on said support structure adjacent another mirror in a substantially circular arrangement.

4. Lighting control apparatus according to claims 2 or claim 3 wherein each mirror is mounted at one end to the support structure such that movement of each of said mirrors is convergent or divergent with respect to the substantially central axis of said support structure.

5. Lighting control apparatus according to any one of the preceding claims wherein a plate is provided between said light source and said mirrors, said plate comprising one or more colour filters and being rotatable so as to provide at least one beam of light with a predetermined colour filter.

6. Lighting control apparatus according to any one of the preceding claims wherein a plate is provided between said light source and said mirrors, said plate comprises at least one cut out portion such that at least one beam of light is adapted to pass through said cut out portion and to provide said cut out shape when reaching the target.

7. Lighting control apparatus according to any one of the preceding claims wherein said support member is adapted to moved in the direction of its central axis upon rotation of said screw.

8. Lighting control apparatus according to claim 7 wherein movement of said support member is motorised.

9. Lighting control apparatus according to claim 1 wherein said mirrors are located with a casing said casing being adapted to rotate about a substantially central axis.

10. Lighting control apparatus according to claim 1 wherein rotation of said casing provides simultaneous rotation of the attached array of mirrors.

11. Lighting control apparatus according to any one of the preceding claims wherein movement and rotation of said mirrors and support member provides corresponding movement of said reflected beams.

12. Lighting control apparatus according to claims 5 and 6 claims wherein rotation of said plates is motorised.

13. Lighting control apparatus according to claim 1 wherein at least one

light source provides a plurality of beams each of said beams being directed onto a corresponding mirror, the colour, shape and movement of each beam being alterable during operation of said lighting control apparatus.

14. Lighting control apparatus substantially as herein described with reference to and as shown in figure numbers 3, 4 and 5.

15. Lighting control apparatus comprising a plurality of mirrors positioned to receive at least one beam of light, said mirrors being mounted on a support structure, said support structure being rotatable, means for providing rotation to said at least one beam of light wherein said beam of light is dividable into a plurality of beams of light upon reflection by said mirrors, each of said reflected beams being adapted to simultaneously rotate about a common axis.

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Application No:	GB 9818853.5	**Examiner:**	Alan Blunt
Claims searched:	1 to 15	**Date of search:**	13 September 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): A6M (MFC), F4R (RAL)

Int Cl (Ed.6): A63J 17/00; F21P 3/00, 5/00, 5/02, 5/04

Other:

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X	GB 952059 (COHEN) - Figure 5	1

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

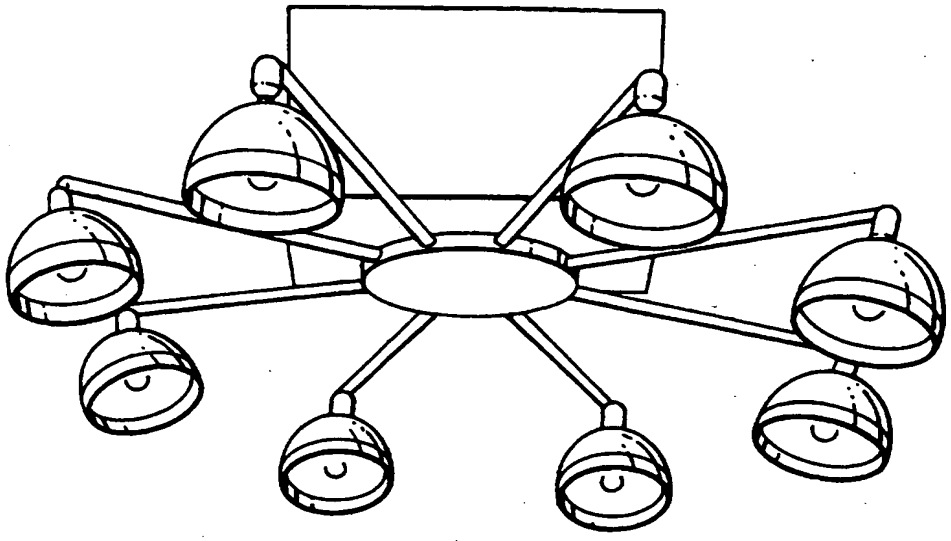


FIG. 1
PRIOR ART

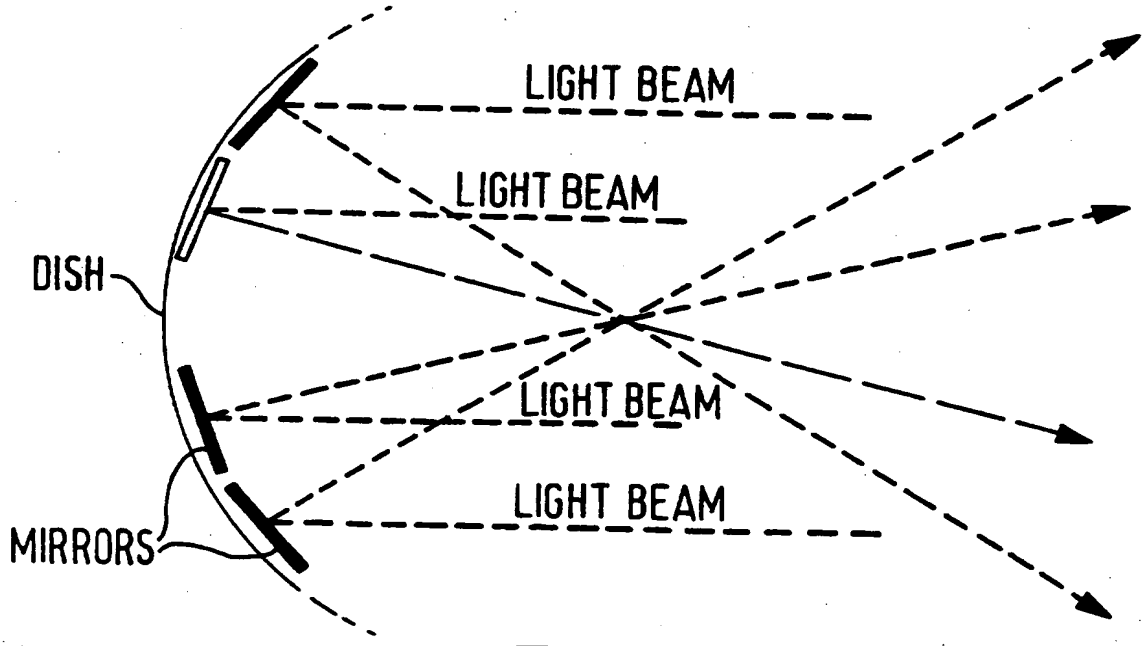
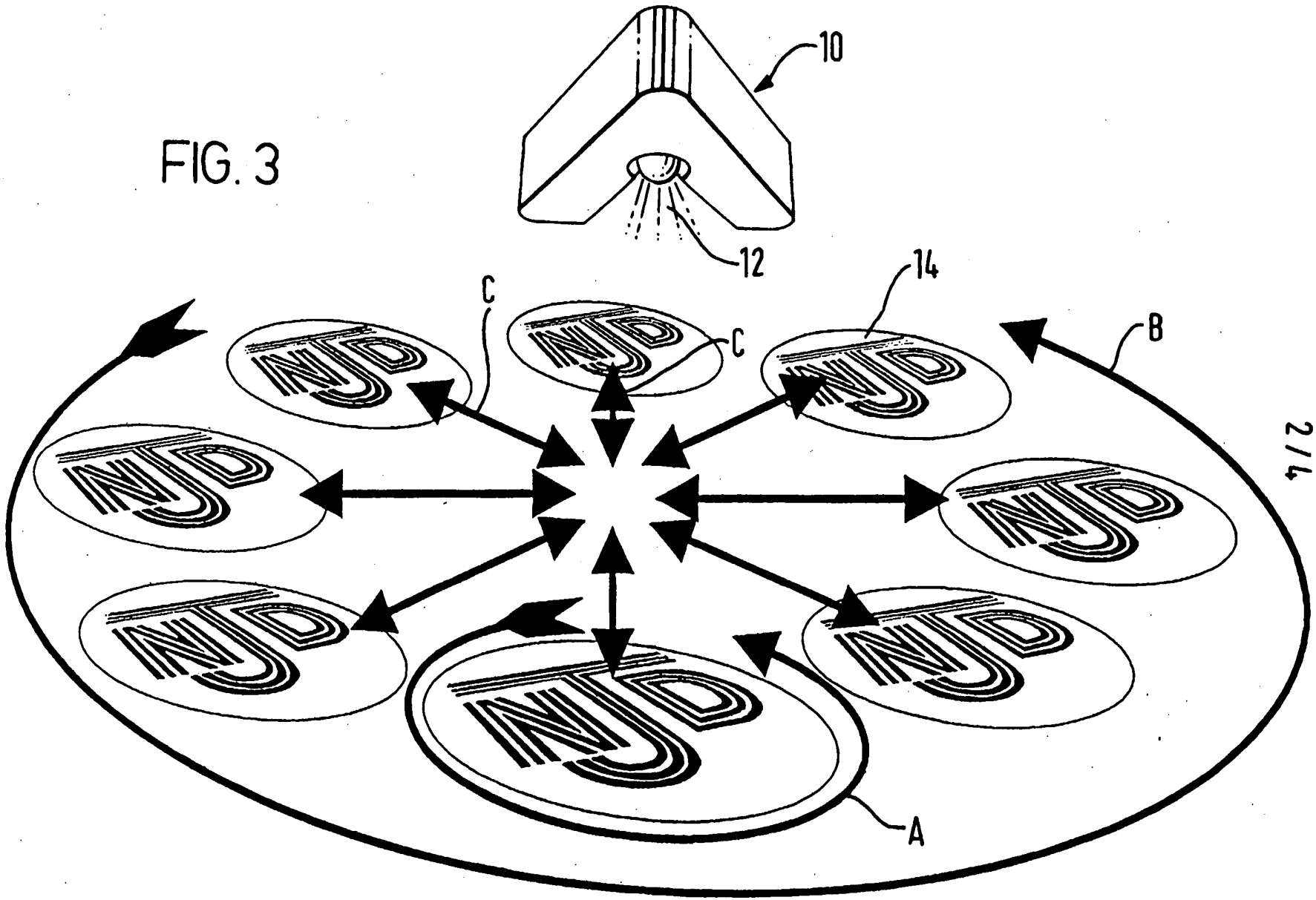


FIG. 2
PRIOR ART

FIG. 3



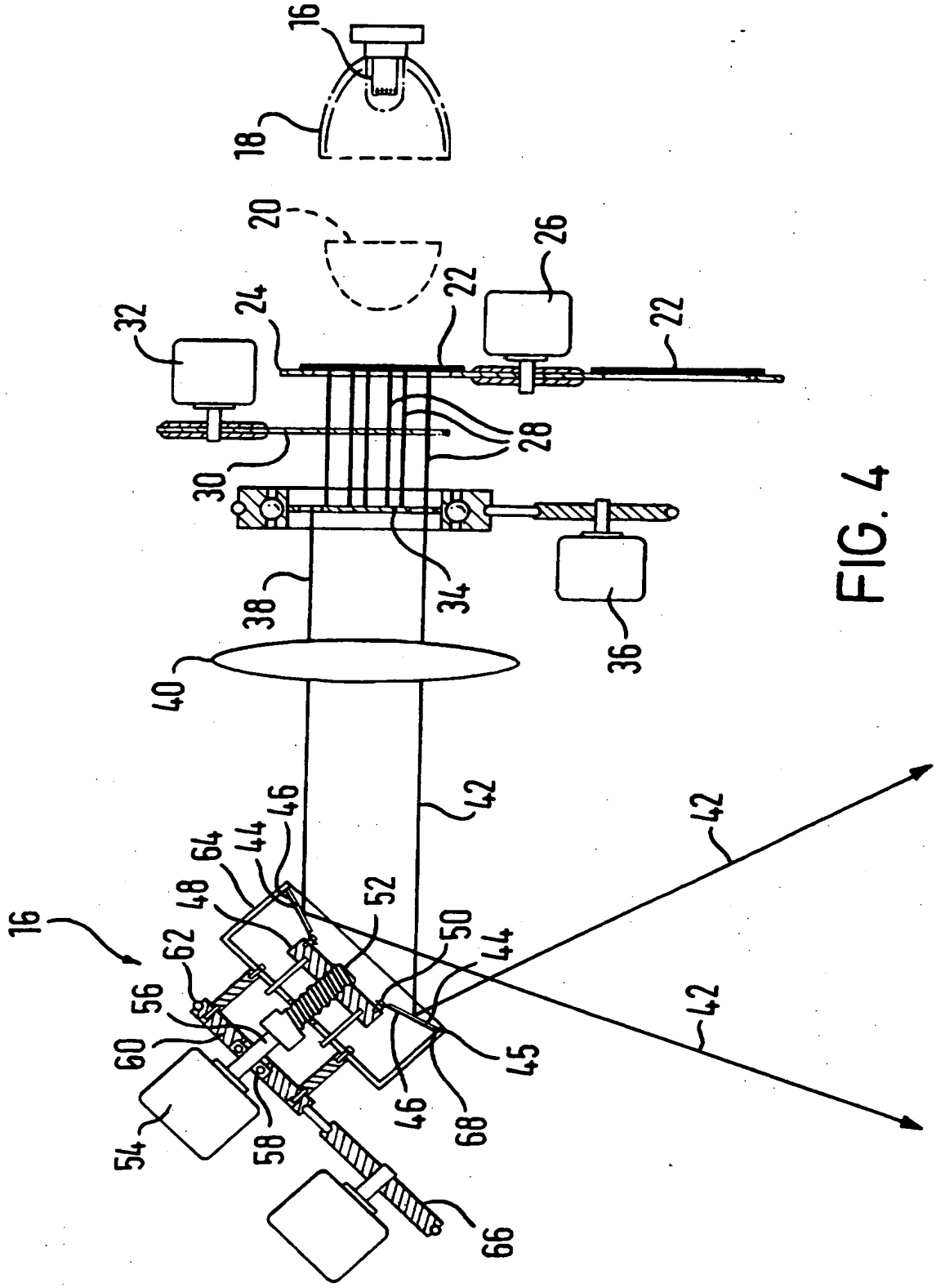

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FIG. 4

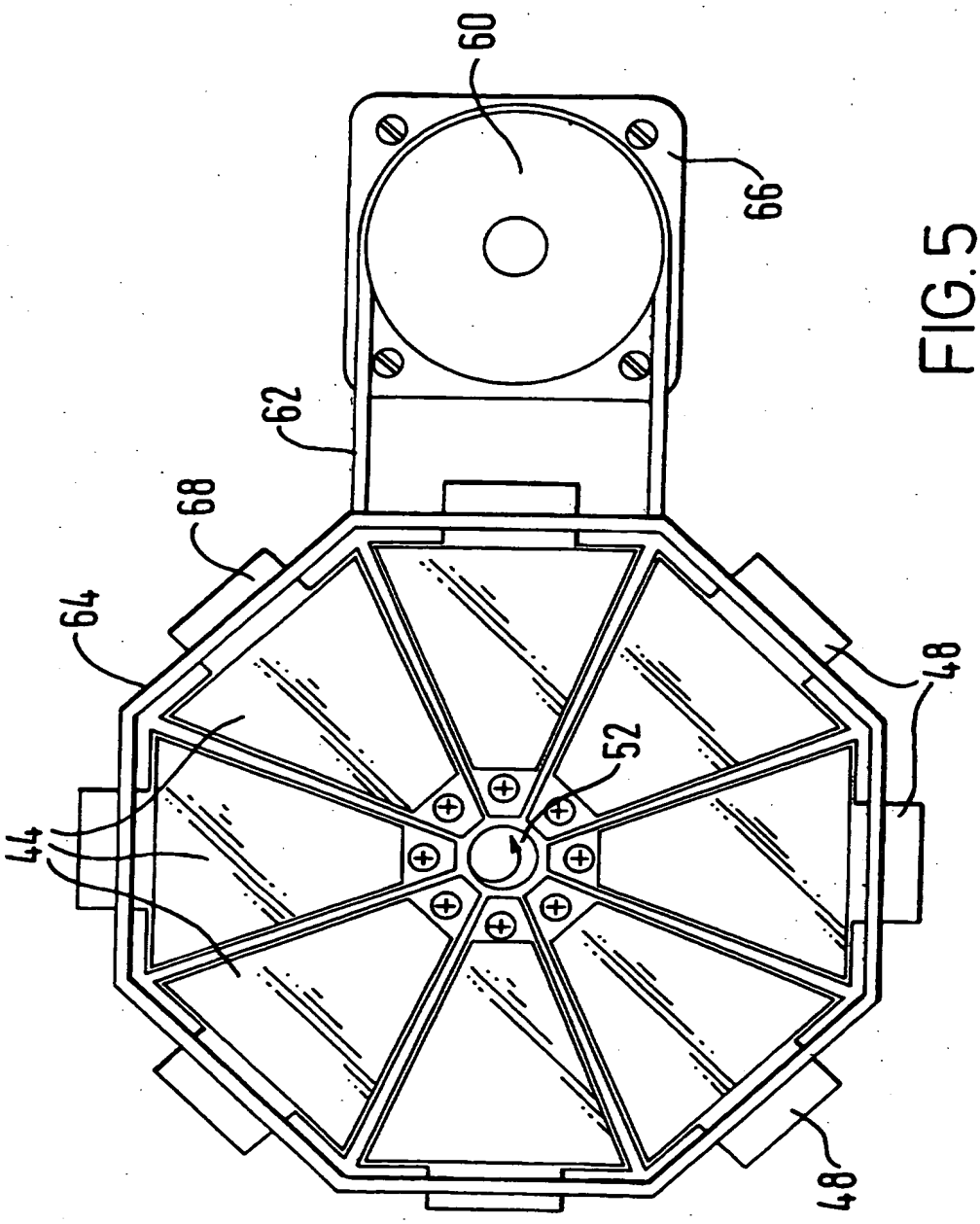

FIG.5